NEWSDAY FILE PHOTO / THOMAS A. FERRARA

A drop of discovery

■ Research shows that inside a cloud, drizzle drops gather in process that limits how long a cloud remains a cloud

BY ROBERT COOKE
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Atmospheric scientists at Brookhaven National Laboratory think they've unraveled the puzzle of drizzle.

For the first time, said atmospheric chemist Robert McGraw, it's becoming clear that tiny water droplets afloat in a cloud have two choices. Either they can coalesce, become heavy enough to fall, and then sweep up even more droplets as they descend through the cloud. Or, they can refuse — and hang around until they evaporate, allowing a cloud to last longer.

The new theory "explains in a quantitative way how different factors can affect the lifetime of a cloud," McGraw said.

McGraw delivered a report on the new findings last week at the annual national meeting of the American Chemical Society in Philadelphia.

The theory is useful, he said, because "drizzle is an important cloud process that plays a crucial role in regulating Earth's energy balance and water cycle, because drizzle affects how long clouds persist."

He said that understanding drizzle formation "will help scientists predict both local weather and the effects of clouds on global climate."

The factors at play include the density of cloud droplets, or how many there are per cubic meter; the amount of air turbulence the droplets encounter; and the abundance of dust particles in the air. Dust supplies the nuclei around which water drops can coalesce.

For drizzle — defined as water droplets less than 0.5 mm in diameters — to begin, he said, enough water droplets must join so they get heavy enough for gravity to overcome the forces that keep them adrift in air.

What McGraw and his research colleague, cloud physicist Yangang Liu, have done is add the phenomenon of "collection" to the picture. Collection is the ability of falling water drops to sweep up even more water as they fall. That limits how long the cloud can remain a cloud.

"Once a drop [of water] reaches a critical size," he said, "the forces of evaporation, condensation and collection are balanced." And then, if the drops get any bigger, the phenomenon called drizzle begins. But if the droplets instead get smaller, they evaporate — and the cloud eventually clears.

Clouds have long ranked as one of the most important climate enigmas. They reflect sunlight back into space, helping keep the atmosphere cool. But they also seem to block or absorb radiant energy emitted from the planet's surface, keeping the atmosphere warm.

Further, water vapor itself is known to be a strong heat-trapping "greenhouse gas."

"We anticipate that this new approach to drizzle will lead to improvements in weather forecasts and climate [analysis]," he said.

Briefing

Drizzle or rain?

Drizzle: Small, slowly falling water droplets, with diameters between 0.2 and 0.5 millimeters.
Rain: Liquid water droplets that fall from the atmosphere, having diameters greater than drizzle
— NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

A lofty plan

NASA has agreed to launch its largest scientific balloons — which carry astronomical telescopes and other equipment for astrophysical experiments and research into cosmic radiation — from a site in northern Sweden, a spokesman said last week. The balloons will be able to remain aloft longer because of prevailing winds in the region and because the trajectory on the way to Alaska would not cross Russia, which has not granted permission for the balloons to pass through its air space.
— AP